PROFESSIONAL ENGINEERING PORTFOLIO

CHARLIE BLACK

Industrial Automation • IT/OT Integration • Industrial Networking • SCADA • Technical Training

A record of practical engineering accomplishments, integrated technology environments, remote monitoring systems, and technical education.

COMPREHENSIVE TECHNICAL PORTFOLIO

Contents

Career History and Technical Leadership

Building and Integrating Five Industrial Automation Technology Centers

Remote Monitoring, SCADA, and Industrial Water Management System

Industrial Automation Training, Education and Technical Workshops

Welcome to the Professional Engineering Portfolio of Charlie Black

Welcome to my engineering portfolio. With over 30 years of hands-on experience across industrial automation, control systems, industrial communications, networking, and SCADA, I have dedicated my career to three core pillars: **leading, teaching, and enabling technical excellence**.

This portfolio is a record of my practical engineering accomplishments, system architectures, and technical training programs.

To discuss training or a project, contact me at notification@gothightech.com or (760) 484-0369.

Career History and Technical Leadership

Professional Engineering Portfolio — Charlie Black

Professional Profile

I am a results-driven industrial technology professional with more than 30 years of hands-on experience in industrial automation, control systems, industrial communications, networking, and Supervisory Control and Data Acquisition (SCADA).

Throughout my career, I have been driven by three things: leading, teaching, and helping others succeed. I enjoy taking complex technical challenges, finding practical solutions, and sharing the knowledge that helps other people grow professionally.

My experience spans technical consulting, solution development, sales, marketing, customer support, professional training, and the design and implementation of industrial hardware and software solutions. I have worked with small businesses, original equipment manufacturers (OEMs), end users, systems integrators, educational institutions, and Fortune 500 enterprises.

My career has evolved alongside industrial technology. My core expertise is in automation systems, industrial networks, SCADA, secure machine-data acquisition, and web-based monitoring. I am now expanding that foundation into industrial cybersecurity and artificial intelligence (AI), exploring how emerging technologies can support the next generation of industrial systems.

Technical Leadership Philosophy

I believe technical leadership is about more than managing projects or selling products. It means understanding how systems work, solving problems when things go wrong, helping people develop their skills, and making complicated technologies easier to understand and use.

Throughout my career, I have combined hands-on technical experience with education, customer support, and solution development.

My approach emphasizes:

- **Leadership through knowledge:** Understanding the technology and helping others apply it effectively.
- **Teaching and mentoring:** Sharing practical experience with students, engineers, maintenance personnel, customers, and technical professionals.
- **Problem solving:** Developing workable solutions across hardware, software, industrial communications, and control systems.
- **Practical engineering:** Connecting technical concepts to real equipment, operating environments, and business requirements.
- **Customer support:** Helping customers understand, implement, operate, and maintain industrial technology.
- **Continued learning:** Building on decades of automation experience while exploring industrial cybersecurity and AI.

Core Technical Expertise

Industrial Automation and Control Systems

- Industrial automation technology
- Programmable Logic Controllers (PLCs)
- Operator Control and Monitoring Systems

- Human-Machine Interfaces (HMIs)
- Industrial control hardware and software
- Plant upgrades and greenfield projects
- OEM machine automation
- Systems integration

Industrial Networking and Communications

- Industrial Ethernet and communications
- Industrial network design and implementation
- Network monitoring and diagnostics
- Secure remote connectivity
- Virtual Private Network (VPN) architectures
- LAN and cellular-router remote support
- Industrial network security and segmentation

SCADA and Machine-Data Systems

- Supervisory Control and Data Acquisition (SCADA)
- Secure machine-data acquisition and analysis
- Web-based monitoring and control interfaces
- Remote equipment monitoring and support
- Industrial data visualization
- Hardware and software integration
- Centralized monitoring and reporting solutions

Emerging Technical Areas

- Industrial cybersecurity
- Secure industrial connectivity
- Artificial intelligence and its potential industrial applications

Professional Experience

RK Controls — Automation Systems, Industrial Networks and SCADA Consultant

December 2017 – Present

Location: Los Angeles Metropolitan Area

In my current role, I provide technical consulting, solution development, sales support, and customer support for high-technology industrial products and systems. My work encompasses automation systems, operator control and monitoring systems, industrial networking, and SCADA.

I help customers address complex industrial requirements through hardware and software solutions tailored to their applications. My experience includes plant upgrades and greenfield projects for industrial facilities, OEMs, and systems integrators.

Key areas of responsibility and expertise include:

- Industrial automation systems and control technologies
- Industrial communication and networking products
- SCADA system design and implementation
- Secure VPN connectivity for industrial applications
- Remote support of equipment over LAN and cellular-router connections
- Web-based technologies for monitoring and controlling machine data

- Technical sales, customer support, and solution development
- Customer education and professional training

My role combines technical knowledge with practical problem solving, helping customers evaluate technologies and implement solutions suited to their operating environments.

Related Engineering Initiatives

Got High Tech — Premier Source for Automation

Got High Tech is an educational and technical resource focused on industrial automation, control systems, networking, and professional development. The platform supports knowledge sharing, technical education, and access to organized learning resources.

Got Monitoring — Water Monitoring System

Got Monitoring presents a centralized water-monitoring approach designed to provide real-time operational insight across connected systems. The solution brings together monitoring, data collection, reporting, and remote access to support water-management applications.

These initiatives reflect my interest in making industrial technologies more accessible through practical engineering, web-based tools, and technical education.

EandM — Senior Account Manager

September 2012 – December 2017

Location: Irvine, California

Responsible for driving sales of high-technology products for the industrial sector, including automation systems, operator control and monitoring systems, and industrial networking.

My responsibilities combined customer relationships and technical solution development. I worked with manufacturing companies, OEMs, and systems integrators on industrial automation requirements, including plant upgrades and greenfield projects.

The role drew on my experience in sales, marketing, hardware and software design, and industrial automation implementation.

Orange Coast College — Automation 1 Program Instructor, Part-Time

February 2016 – June 2017

Location: Costa Mesa, California

Taught students the fundamentals of programmable logic control systems and their practical application.

Instruction covered:

- Identifying PLC system components
- Evaluating and calibrating PLC components
- Diagnosing control system components
- Analyzing and developing control system documentation
- Constructing open-loop and closed-loop control systems
- Evaluating and diagnosing open-loop and closed-loop PLC performance

This position directly connected my industrial experience with technical education, helping students develop foundational skills in automation and control.

Walters Wholesale Electric — Automation Technology Manager

January 2008 – October 2012

Location: Brea, California

Responsible for driving sales, training, and marketing efforts for high-technology industrial products.

The role combined automation technology knowledge with customer education, technical support, and business development. It built on my experience helping customers understand industrial automation products and apply them to their operations.

California State University, Long Beach — CCPE Instructor

April 2009 – August 2011

Location: Long Beach, California

Worked as an instructor through the university's continuing and professional education program.

This role formed part of my broader commitment to professional education and sharing industrial technology knowledge with others.

RK Controls — Automation Technology Manager

July 2001 – January 2008

Location: Irvine, California

Responsible for operating an Automation Technology Center focused on sales, training, and customer support.

The position combined technical leadership with customer-facing responsibilities, helping connect industrial automation products and technologies with customer requirements.

The Technology Center provided a setting for demonstrating products, supporting customers, and developing technical knowledge through training.

County Wholesale Electric — Automation Technology Manager

July 1999 – July 2001

Responsible for sales, training, and customer support for automation products.

This position contributed to the development of my experience in industrial automation technology, technical education, and customer support.

Education and Technical Qualifications

Orange Coast College

Controls and Automation — Master's Degree Equivalency

2015

The equivalency was determined by department faculty. The record identifies Automation 2 and Programmable Logic Controllers coursework, including ELEC 253.

The qualification reflects assessed occupational proficiency based on the minimum number of years identified under Assembly Bill 1725.

DeVry University

Digital Electronics Technician Diploma — Digital Electronics

1982 – 1984

Location: Phoenix, Arizona

This education provided a foundation in digital electronics that supports my subsequent work in industrial control systems, automation hardware, and technical problem solving.

Teaching, Training, and Knowledge Sharing

Teaching has been a consistent part of my career. I have conducted hundreds of training classes, from individual workshops to working with larger educational institutions.

My training activities cover more than PLC programming. They include industrial communications, network reliability, industrial cybersecurity, motor management, and industrial visualization.

I have developed organized instructional materials and hands-on laboratory exercises to help participants move from theory to practical application. My MediaWiki knowledge management platform brings technical information and training resources together in one place.

My goal is to help students and professionals understand not only how to configure a technology, but also how it fits into a functioning industrial system.

Engineering Approach and Problem Solving

My work has consistently involved translating technical requirements into practical solutions. That means considering the interaction between hardware, software, communications, control systems, and the people who must operate and maintain them.

My experience includes supporting customers across a wide range of environments, from small businesses to large manufacturing organizations. I focus on understanding the underlying problem, identifying suitable technologies, and helping customers move toward a working solution.

I value practical results, dependable system operation, clear technical communication, and the transfer of knowledge that allows others to maintain and improve what has been implemented.

Looking Ahead: Industrial Cybersecurity and AI

Industrial automation continues to evolve as control systems become more connected and data becomes increasingly important to operations.

Building on my background in automation, networking, SCADA, and secure remote connectivity, I am extending my technical focus into industrial cybersecurity and artificial intelligence.

These areas represent a natural progression from my existing work: understanding industrial equipment and data, protecting communications and systems, and exploring new ways to make technical information more useful.

My objective is to continue learning, developing practical solutions, and helping others understand and apply emerging technologies responsibly.

Professional Summary

With more than 30 years of experience, my career brings together industrial automation, networking, SCADA, technical consulting, sales, customer support, and education.

I have worked across technical and management roles, supported industrial customers, helped develop automation solutions, managed technology training environments, and taught students and professionals.

What connects these experiences is a commitment to leadership through knowledge: making complex systems understandable, helping people build their skills, and turning technical challenges into practical results.

Charlie Black — Industrial Automation, IT/OT Integration and Engineering Leadership

Building and Integrating Five Industrial Automation Technology Centers

Professional Engineering Portfolio — Charlie Black

Project Overview

Throughout my career, I have built five industrial automation technology and training centers, each designed to combine live industrial automation equipment with practical, hands-on training capabilities.

Five Technology Centers

- **County Wholesale Electric** — Orange, California
- **County Wholesale Electric** — San Diego, California
- **Soffa Industries** — Irvine, California
- **Walters Wholesale Electric** — Vernon, California
- **RK Controls** — Commerce, California

The Commerce facility represents a significant development in this work, incorporating enterprise IT infrastructure, industrial automation, network management, segmented communications, cybersecurity architecture, remote connectivity, and dedicated student and instructor training stations.

Commerce Technology Center — IT/OT Integration

Project Scope

The Commerce technology center integrates office computing, industrial networking, automation equipment, server infrastructure, centralized monitoring, and hands-on training within a common environment.

The installation encompasses office IT, industrial OT, network monitoring, system administration, engineering software, remote connectivity, and training infrastructure.

Enterprise IT Infrastructure

- Office and engineering workstations, network printers, and a presentation station for demonstrations and meetings.
- Application and infrastructure servers with centralized directory services for the office and automation environments.
- A dedicated Siemens engineering station with centralized TIA Portal software update management.
- Network storage for office and engineering files.

Industrial Automation and Supervisory Monitoring

Programmable Logic Controllers (PLCs)

- **8 different Siemens S7 PLCs** running automation programs, including the S7-1200 G2 generation.
- Additional S7-1200 controllers dedicated to student and instructor training stations.

Human-Machine Interfaces (HMIs)

- **4 Siemens HMI panels** representing different generations of operator-interface technology, including Unified Comfort Panels.

- Dedicated KTP700 operator panels for student and instructor training.
- Additional operator interfaces at remote training stations.

Supervisory Monitoring and Engineering

- Siemens WinCC Professional providing network-monitoring visualization using OPC UA.
- **1 Siemens WinCC Unified server.**
- **1 Siemens Multiuser Server.**

These technologies provide an environment for demonstrating PLC programming, operator-interface development, supervisory visualization, industrial communications, and engineering workflows.

Industrial Network Architecture and Monitoring

The facility uses a segmented, defense-in-depth network design built on Siemens industrial networking products.

- Separate network environments for office IT, industrial automation, training, and remote access.
- Managed SCALANCE Industrial Ethernet switching, including a redundant ring network for the training equipment.
- Industrial routers and firewalls enforcing segmentation between network zones.
- Centralized network management covering every network zone, with network status shown on a WinCC SCADA screen over OPC UA.
- Centralized log collection for system and security events.

The combination of network management, log collection, and supervisory visualization demonstrates the integration of IT services with industrial operational requirements.

Hands-On Student and Instructor Training

Student Training Stations

Four dedicated student stations provide practical automation training.

Each station includes:

- 1 Intel NUC training computer.
- 1 Siemens S7-1200 PLC.
- 1 Siemens KTP700 operator interface.
- 1 Siemens XB216 ethernet switch

These stations support PLC programming, HMI configuration, controller-to-interface interaction, and practical automation exercises.

Instructor Training Station

The instructor has a dedicated station comprising:

- 1 Siemens S7-1200 PLC.
- 1 Siemens KTP700 operator interface.

This station supports instructor-led demonstrations and training activities.

Remote Training Stations

Two remote stations extend the training environment beyond the main facility. These incorporate additional Siemens S7-1200 controllers, KTP700 operator panels, and Siemens SIRIUS command PROFINET pushbutton stations with illuminated indicators.

These stations provide physical controls and visual feedback for industrial automation exercises.

Remote Connectivity and Wireless

The center supports secure remote access to industrial systems, remote training stations connected over cellular networks, and industrial wireless infrastructure. These capabilities provide a practical environment for demonstrating remote access within a defined, segmented network architecture.

Engineering Significance

The Commerce technology center integrates several technical disciplines within a single working environment:

- Enterprise IT infrastructure and industrial OT systems.
- Siemens PLCs, HMIs, and engineering platforms.
- Industrial Ethernet switching and segmented network architecture.
- Centralized network management and supervisory visualization.
- Server infrastructure, directory services, storage, and syslog collection.
- Dedicated student and instructor training stations.
- Remote automation stations using cellular communications.
- Secure remote connectivity for staff and industrial systems.
- Wireless infrastructure and multiple network environments.

Rather than treating office IT, industrial networking, automation, and training as isolated disciplines, the center brings them together within a common technology environment.

Professional Contribution

Building five industrial automation technology and training centers represents a substantial body of practical engineering experience.

The Commerce installation extends this experience into the integration of enterprise IT, industrial OT, Siemens automation platforms, network management, segmented communications, remote connectivity, and live training infrastructure.

This work demonstrates experience across infrastructure planning, equipment integration, industrial network architecture, automation systems, monitoring, engineering workstations, and practical technical education.

The Commerce center serves as a significant example of integrating enterprise computing and industrial automation into a unified technology and training environment.

Remote Monitoring, SCADA, and Industrial Water Management System

Professional Engineering Portfolio — Charlie Black

Project Overview

I developed a remote monitoring and supervisory control system designed to provide centralized visibility, data collection, reporting, notifications, and remote access across geographically distributed industrial and commercial water treatment applications.

The system is used in operating environments where water quality, process conditions, water treatment performance, and documented reporting are important operational requirements. It combines industrial PLCs, remote communications, centralized SCADA servers, web-based interfaces, automated reports, and secure VPN connectivity.

The platform supports both new water treatment installations and upgrades to existing systems. Its architecture accommodates multiple remote locations while providing customers with access to live process information, historical trends, maintenance information, alarms, and reports.

The system is designed to support continuous operation, remote diagnostics, proactive maintenance, and access to operational information through a standard web browser.

Industrial and Commercial Applications

The remote monitoring system supports several different applications, each with its own process requirements and reporting needs.

Oil and Gas Separation

The system monitors large PLC-controlled oil and gas separation projects involving water cleanup and the separation of oil from water.

Remote monitoring provides visibility into process conditions and supports the collection of operational data from the separation equipment.

Meat Processing and Wastewater Treatment

Meat processing facilities must treat wastewater before discharging it into municipal drainage systems. Daily reports are required to support operational documentation and city inspection requirements.

The monitoring system provides process visibility and automated reporting to help customers maintain records of their wastewater treatment activities.

Rainwater Collection and Beer Manufacturing

The system supports applications that collect rainwater, treat it, and use the recovered water in beer manufacturing.

Monitoring and reporting provide operational information about the water treatment process and support the documentation requirements associated with the application.

Reverse Osmosis (RO) Water Filtration

The system monitors reverse osmosis water treatment installations, including flow, total dissolved solids (TDS), and salt-related water quality measurements.

One application supports a customer producing coffee for public consumption, where consistent water quality and filtration performance are important to the production process.

System Architecture and Centralized Infrastructure

Central Master Servers

The system operates using multiple central master servers hosted in the cloud. These servers provide the centralized infrastructure for the SCADA system, data concentration, and reporting functions.

The architecture consolidates information from remote industrial stations and makes operational data available for monitoring, analysis, and report generation.

Remote Monitoring Stations

Remote stations use commercially available PLC hardware, allowing installations to use established industrial automation equipment with manufacturer support and product lifecycle provisions.

Each remote station incorporates the equipment required to acquire process data and communicate with the centralized monitoring infrastructure through the remote-access network.

The use of established PLC platforms provides a foundation for repeatable installations and scalable deployment across different customer sites.

Cloud Hosting and Secure Connectivity

The architecture uses cloud-hosted central servers and encrypted VPN connections between each remote site and the central system. Because the core infrastructure is hosted in the cloud, sites can be added or relocated without moving central equipment.

Customer Web Access

Customers access their monitoring information and reports through a standard web browser.

Access is protected by individual usernames and passwords, providing an authenticated interface for viewing the information associated with their systems.

The web-based approach allows customers to review operational information without requiring a dedicated SCADA workstation at every location.

Monitoring Capabilities

The system continuously collects and analyzes process information from sensors and connected industrial equipment, providing visibility into operating conditions across multiple locations.

Water Quality Monitoring

The platform supports monitoring of important water quality and process parameters, including:

- **Total Dissolved Solids (TDS):** Monitors dissolved substances and water quality indicators.
- **pH levels:** Tracks acidity and alkalinity.
- **Conductivity and salt levels:** Monitors conductivity and salinity-related measurements.
- **Turbidity:** Provides information about water clarity.
- **Dissolved oxygen:** Monitors oxygen content.

- **Flow and pressure:** Tracks system output, water usage, and filter condition.

Alarms, Notifications, and Reports

When a reading drifts outside its limits, the system notifies the right people by text and email. Automated daily reports document system performance for operators, service providers, and inspectors.

Industrial Automation Training, Education and Technical Workshops

Professional Engineering Portfolio — Charlie Black

Professional Training Experience

I have delivered hundreds of training classes, ranging from one-day technical workshops to working with larger educational institutions. My training experience spans industrial automation, PLC programming, industrial communications, network reliability, industrial cybersecurity, motor management, and visualization systems.

My approach combines technical instruction with practical laboratory exercises. The objective is to help engineers, maintenance personnel, customers, and technical professionals understand industrial technologies and apply that knowledge to real-world automation challenges.

Educational Institutions

- California State University, Long Beach, California
- Orange Coast College, Costa Mesa, California

Training Delivery Methods

- Classroom instruction
- Online training
- Instructor-led technical workshops
- Hands-on equipment laboratories
- Software configuration and programming exercises
- Personalized training for different experience levels

Training Program and Technical Disciplines

The training program covers several distinct areas of industrial technology. PLC programming is an important part of the curriculum, but it is only one component of a broader technical education offering.

Industrial Automation and PLC Engineering

- Basics of the PLC Workshop
- SIMATIC S7-1200 — Compact Controller Workshop
- SIMATIC S7-1500 — Advanced Controllers Workshop

Industrial Communications and Cybersecurity

- Reliable Networking Workshop
- Defense in Depth Workshop
- IO-Link Workshop
- Network Management Workshop — SINEC NMS

Motor Management

- SIMOCODE Pro Workshop

Industrial Visualization

- Visualization Systems Workshop — SIMATIC WinCC Unified

Industrial Edge and AI

- Industrial Edge Workshop
- AI for the Factory Floor Workshop

Basics of the PLC Workshop

Workshop Overview

This introductory workshop covers programmable logic controllers (PLCs), operator interface panels, and fundamental industrial communication networks. The program combines lectures with hands-on laboratory exercises using a PLC training station and a computer equipped with programming software.

The workshop includes practical programming, hardware configuration, diagnostic exercises, and an instructor-selected capstone application.

The lecture materials and laboratory exercises are fully prepared, so this workshop can be scheduled on short notice.

Learning Objectives

Participants learn to:

- Identify PLC components and features.
- Use core instructions, functions, and function blocks.
- Construct and test a basic control program.
- Differentiate between analog and digital devices.
- Navigate programming software.
- Configure PLC hardware.
- Develop, document, test, and troubleshoot basic programs.
- Use programming software diagnostic tools.
- Configure PLC hardware and communication networks.
- Manage tags and create basic operator-interface screens.
- Use the Operator Interface Simulator to view screens remotely.

Training Materials and Laboratory Exercises

- Basics of PLCs training material
- Analog Tank exercises
- Numbering System exercises
- Parking Lot exercises
- STEP 2000 training workbooks
- TIA Portal Getting Started
- TIA Portal Function Calls
- TIA Portal Function Blocks
- TIA Portal Human Machine Interface

Target Audience

- Engineers and technicians new to automation
- Individuals seeking an introduction to SIMATIC PLCs
- Engineering personnel

- Maintenance personnel
- Teams with medium- to high-level automation control requirements

Defense in Depth Workshop

Workshop Overview

This workshop introduces the Defense in Depth approach to industrial control system security. It examines how multiple layers of protection can help safeguard industrial networks and control systems against unauthorized access and other security threats.

The course emphasizes industrial Ethernet security and Siemens SCALANCE S products, with practical instruction in network addressing, segmentation, routing, firewalls, and secure remote communications.

Technical Topics

- The meaning and importance of industrial security
- IP addressing and subnetting
- Routing techniques, including masquerading
- Virtual LAN (VLAN) implementation
- VLAN routing
- Network Address Translation (NAT)
- Firewall configuration practices
- Secure tunneling using SINEMA Remote Connect

Training Resources

- Defense in Depth instructor station
- Defense in Depth student laboratory stations
- Technical presentations
- Siemens Industry Mall
- Siemens Industry Online Support

Target Audience

- Engineering and information technology personnel
- Teams new to industrial networking and security
- Teams evaluating industrial security products
- Organizations with medium- to high-level network security requirements

IO-Link Workshop

Workshop Overview

This workshop introduces IO-Link as an open, standardized, point-to-point communication technology for connecting sensors, actuators, motor starters, and other field devices to automation systems.

The course explores device-level communication, diagnostics, data management, and the potential to simplify the integration of industrial components.

Technical Topics

- IO-Link fundamentals
- Technical features and value propositions
- Applications for smaller, less complex systems

- Applications for larger automation systems
- Sensor and actuator connectivity
- Motor starter and cabinet component integration
- Device diagnostics and data management
- Multi-vendor connectivity
- Integration with industrial communication networks

Training Resources

- IO-Link training presentation
- IO-Link hands-on training laboratories
- Siemens Industry Mall
- Siemens Industry Online Support

Target Audience

- Engineering personnel
- Maintenance personnel
- Teams seeking device-level communication solutions
- Teams looking to avoid unnecessary additional networks for sensors and motor starters

Reliable Networking Workshop

Workshop Overview

The Reliable Networking Workshop focuses on industrial network availability, reliability, monitoring, and troubleshooting. Participants work through guided laboratory exercises using industrial networking hardware and software, with particular emphasis on the Siemens SCALANCE switch family.

The workshop addresses how industrial networks can be configured and managed to meet the availability requirements of automation applications.

Technical Topics

- Fundamental networking concepts
- Differences between office and industrial networks
- Industrial networking product portfolio
- Web-based device management
- Switch diagnostics and troubleshooting
- System folders and information logs
- Layer 2 network configuration
- Redundant industrial ring configuration
- Coupling redundant rings
- Industrial network monitoring
- Interconnection with IT systems using passive listening

Training Resources

- Reliable Industrial Networks training laboratory
- Step-by-step network configuration exercises
- Industrial switch demonstrations
- Siemens Industry Mall
- Siemens Industry Online Support

Target Audience

- Engineering personnel
- Maintenance personnel
- Teams new to industrial networking
- Organizations seeking improved industrial network reliability
- Teams with medium- to high-level networking requirements

SIMATIC S7-1200 — Compact Controller Workshop

Workshop Overview

This workshop covers the Siemens SIMATIC S7-1200 family of modular controllers designed for compact automation systems. The course addresses PLC logic, operator interfaces, networking, engineering efficiency, diagnostics, and integrated controller functions.

Participants explore standard and failsafe controller options and use TIA Portal engineering tools through presentations and hands-on exercises.

Technical Topics

- Controller setup and configuration
- Introduction to TIA Portal
- Efficient engineering practices
- Integrated technology functions
- Online diagnostics and maintenance
- Data logging and recipes
- Virtual commissioning functions
- Integrated OPC UA server
- Integrated security functions
- Communication and networking
- Human-machine interface integration
- Unified data management and tag organization

Training Resources

- SIMATIC S7-1200 basic controller presentation
- S7-1200 setup instructions
- S7-1200 product overview
- TIA Portal introduction
- Efficient engineering exercises
- Technology functions exercises
- Online diagnostics and maintenance exercises
- Data logging and recipes exercises
- Virtual commissioning exercises
- OPC UA server exercises
- Integrated security exercises
- S7-1200 Basic Controllers brochure
- S7-1200 Modernization Made Easy brochure
- S7-1200 starter kits

Target Audience

- Engineering personnel

- Maintenance personnel
- Teams new to SIMATIC controllers
- Teams developing compact automation systems
- Teams interested in integrated communications, diagnostics, and security

SIMATIC S7-1500 — Advanced Controllers Workshop

Workshop Overview

This workshop introduces the SIMATIC S7-1500 family of advanced controllers for medium- and high-end automation applications.

The course explores controller performance, integrated drive capabilities, safety and security features, commissioning, diagnostics, and specialized controller configurations. Instruction combines technical presentations with product demonstrations and TIA Portal laboratory exercises.

Technical Topics

- SIMATIC S7-1500 advanced controller capabilities
- Controller commissioning and diagnostics
- Integrated drive functions
- Integrated safety and security
- Redundant controller systems
- SIPLUS controller options for demanding environments
- Multi-Function Platform (MFP) CPU applications involving C/C++ integration
- TIA Portal programming and engineering
- Function calls and function blocks
- Human-machine interface engineering

Training Resources

- SIMATIC S7-1500 Advanced Controllers presentation
- SIMATIC S7-1500 Redundant Systems presentation
- SIMATIC S7-1500 demonstration
- TIA Portal Getting Started
- TIA Portal Function Calls
- TIA Portal Function Blocks
- TIA Portal Human Machine Interface

Target Audience

- Engineering personnel
- Maintenance personnel
- Teams evaluating advanced SIMATIC controllers
- Teams requiring redundant PLC systems
- Teams with specialized controller requirements
- Teams operating in harsh environments
- Teams interested in C/C++ integration with a standard PLC

SIMOCODE Pro Workshop

Workshop Overview

The SIMOCODE Pro Workshop addresses motor management, protection, monitoring, and control for full-voltage motor applications.

The course explores applications involving pumps, conveyors, ventilation, and other motor-driven equipment. It introduces how motor management can protect motors while supporting process protection and operational visibility.

Technical Topics

- SIMOCODE Pro system overview
- Motor protection and monitoring
- Motor management concepts
- Motor-driven process applications
- Pumping, conveyor, and ventilation applications
- Product configuration and practical demonstrations

Training Resources

- SIMOCODE Pro presentation
- SIMOCODE Pro hands-on laboratory
- Siemens Industry Mall
- Siemens Industry Online Support

Target Audience

- Engineering personnel
- Maintenance personnel
- Teams evaluating motor management solutions
- Teams with specialized motor protection and monitoring requirements

Visualization Systems Workshop — SIMATIC WinCC Unified

Workshop Overview

This workshop introduces SIMATIC WinCC Unified engineering software and Unified HMI panels for machine and plant visualization.

The course explores visualization hardware, software, and web technologies integrated into TIA Portal. Participants work with screen layouts, navigation, alarms, data logging, trends, and reusable faceplates.

Technical Topics

- Introduction to WinCC Unified
- Screen layout using picture windows
- Screen navigation
- Screen engineering
- Alarm configuration
- Data logging and trending
- Faceplate development
- Unified HMI panels
- Visualization engineering in TIA Portal

Training Resources and Laboratories

- WinCC Unified presentation
- WinCC Unified Lab 01 — Device Handle
- WinCC Unified Lab 02 — Screen Navigation
- WinCC Unified Lab 03 — Screen Engineering
- WinCC Unified Lab 04 — Faceplates
- WinCC Unified Lab 05 — Alarming
- WinCC Unified Lab 06 — Logging and Trending
- WinCC V7.x Reverse Osmosis Water Plant laboratory
- WinCC Unified starter kits
- Siemens Industry Mall
- Siemens Industry Online Support

Target Audience

- First-time SIMATIC WinCC users
- Original equipment manufacturers (OEMs)
- SIMATIC PLC users
- Users of third-party PLCs
- Engineering personnel
- Maintenance personnel

Network Management Workshop — SINEC NMS

Workshop Overview

This workshop shows how to see every switch, router, and controller on a plant network in one place. Participants install SINEC NMS, discover the network automatically, configure alarms and email notifications, and publish network status to SCADA over OPC UA.

Technical Topics

- SINEC NMS architecture: Control and Operation
- Automatic device discovery and network topology
- Device, port, and VLAN status at a glance
- Alarms, email notifications, and reports
- Firmware and configuration management
- Publishing network status to SCADA with OPC UA

Target Audience

- Teams responsible for plant network uptime
- Engineers who have completed the Reliable Networking Workshop

Industrial Edge Workshop

Workshop Overview

This one-day, hands-on workshop introduces Siemens Industrial Edge, which brings computing, data, and applications directly to the machine. Participants work with Industrial Edge Management, edge devices, PLC connectors, the Databus, Flow Creator, dashboards, and custom applications, and run an AI model at the edge.

Technical Topics

- Industrial Edge Management and edge devices
- S7 and OPC UA connectors
- The Industrial Edge Databus
- Data flows with Flow Creator
- Dashboards and performance KPIs
- Custom applications and AI inference at the edge

Target Audience

- Controls and automation engineers
- IT/OT teams planning edge computing and data projects

AI for the Factory Floor Workshop

Workshop Overview

This four-week program, split evenly between lecture and hands-on labs, applies artificial intelligence to real industrial process data. Participants learn to prepare industrial data, detect anomalies, use AI-assisted troubleshooting, and build predictive maintenance models, finishing with a documented project on real process data.

Technical Topics

- Industrial data collection and preparation
- Anomaly detection
- AI-assisted troubleshooting
- Predictive maintenance
- Final project on real process data

Target Audience

- Engineers and technicians moving into industrial data and AI
- Teams planning predictive maintenance programs

Training Development and Knowledge Management

A key part of the training program is the preparation and organization of reusable educational material. An online knowledge base provides a central location for workshop descriptions, lecture materials, laboratory instructions, and supporting technical resources.

The existing PLC fundamentals material is configured and ready for use. Other workshop resources are organized around their respective technical subjects, presentations, and hands-on laboratory exercises.

This approach supports repeatable instruction, easier access to technical resources, and training programs that can be adapted to different audiences and levels of experience.

Engineering and Educational Impact

The breadth of this training program demonstrates experience across multiple industrial technology disciplines rather than PLC instruction alone.

The workshops address the relationship between automation controllers, industrial networks, cybersecurity, field-device communications, motor management, and visualization systems. This broader

perspective helps participants understand how individual technologies contribute to the operation, reliability, and security of an industrial automation system.

By combining technical instruction with practical laboratories, the program supports engineers and maintenance personnel as they develop the skills needed to configure, operate, diagnose, and maintain industrial systems.

Workshop Portfolio Summary

The current workshop offering includes eleven distinct technical programs:

- **PLC fundamentals:** Basic programming, hardware configuration, diagnostics, and operator interfaces.
- **Industrial cybersecurity:** Defense in Depth, network segmentation, firewalls, and secure remote connectivity.
- **Device communications:** IO-Link, field devices, diagnostics, and data management.
- **Network reliability:** Industrial switching, redundancy, monitoring, and troubleshooting.
- **Compact automation:** SIMATIC S7-1200 controllers and TIA Portal.
- **Advanced automation:** SIMATIC S7-1500 controllers, redundancy, and specialized applications.
- **Motor management:** SIMOCODE Pro motor protection and process applications.
- **Industrial visualization:** SIMATIC WinCC Unified, HMI engineering, alarms, logging, and trends.
- **Network management:** SINEC NMS device discovery, topology, alarms, and network status in SCADA over OPC UA.
- **Industrial Edge:** Edge management, edge devices, PLC connectors, the Databus, Flow Creator, dashboards, and AI at the edge.
- **Industrial AI:** AI for the Factory Floor, a four-week program covering anomaly detection, AI-assisted troubleshooting, and predictive maintenance.

The combination of these courses represents a broad industrial technical education program supported by prepared instructional materials, software exercises, product demonstrations, and hands-on laboratories.